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Earthquake and storm risk of the power transmission grid of Switzerland

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The power transmission grid of Switzerland is an important part of the synchronized European grid being one of the most complex infrastructure systems. Natural impacts, such as earthquakes or winter storms, may result in failure of components and disrupt the normal operation of the electric-power infrastructure. We research the failure risk of the transmission grid of Switzerland by combining different sub models for the natural hazard, the probability of element failure as a direct result of local disaster impact and the power flow stability in the grid including secondary failure. The earthquake hazard is modelled by an adaptation of an existing one. In contrary to this, a complex stochastic model has to be build for the winter storm hazard. It describes the spatial dependency between the local impacts at different sites. Furthermore we formulate appropriate vulnerability models for the relation local impact – failure probability. In a last step random events are Monte Carlo simulated and the related power flow is computed for the case of element failure (power lines, transformer stations). A first realistic and detailed risk estimation for the Transmission grid of Switzerland in case of earthquake and winter storm is computed. The transmission grid is relative robust against the effects of winter storm and earthquake. Therein the winter storm causes more often events with a relative small number of failed elements compared with rare earthquake events which can result in a larger number of failed elements.